

**Cross Curricular Essay**  
**Physics & Sports/ Fitness**

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Physics can be related to sports and fitness on many different levels. When you lift weights, play sports or even buy athletic equipment you probably don't know how much physics was really put into any of it. Weightlifter's need to know which workout is better. Also the equipment athletes use relate to physics. Manufactures design equipment for athletes, which involve physics. The manufactures need to think about what will make the object better and what materials will cause the equipment to work to its max potential. Athletes need to know, how fast they need to run to get to a certain height. All of these have something in common, fitness/sports and physics.

Weightlifting is a session used to maintain body strength and to build muscle. Weightlifting relates to physics because weight trainers need to know which is appropriate for a certain workout. I believe that with free weights one needs to have more balance. With weightlifting machines they already have the gravity and everything needed so there is not much balance that one would need. When one is using a weightlifting machine, it helps them to focus on a couple muscles rather than many muscles when using free weights. The Shoulder Press is a weightlifting machine used only to work out the deltoids with pulleys and forces used upon its self, it lets ones only focus be the deltoids. Also, another reason weightlifting relates to physics is, the effects that can happen to a person when they are weightlifting with machines. Although easier to work with than free weights, weightlifting machines produce inertia effects that can double the force experienced by a user. Muscles and ligaments can be damaged by this sort of inertia-generated overload. To avoid injuries, coaches and therapists prefer that resistance remain constant throughout the range of a user's movements; Conventional

weightlifting machines use pulleys and stacked weights, clutches, shock absorbers, or rubber tension elements to produce resistance. By employing a gas spring as a source of uniform resistance, this new exercise machine eliminates inertia problems and provides a workout much like that experienced with free weights.(1). Inertia is a part of Newton's first law. This inertia can be serious in many ways, in order to have the right body building techniques; you need to know which exercise is best. Therefore physics is related to weightlifting.

The designers of sports equipment, most likely have a high knowledge of physics. The designers have to know just about everything because many sports involve motion, mass, energy and gravity. They need to know how to make the best or how to improve on the sports equipment. In many sports equipments there is physics related to it. Many sports equipment is being improved on yearly. The manufactures must have the knowledge to discover the best and design it. Manufactures need to find out what will make someone or something go faster, or the highest something can go, or even how certain materials can bend, vibrate and the elasticity. "I have been able to correlate the vibrational frequencies of bat barrels to measured performance, and have significantly contributed to an understanding of the trampoline effect in a hollow bat".(2) Mr. Drussell has been able to collect data and, combined it to create a bat, used in baseball. He looked for the maximum vibrations, which will help the ball project faster and helps the player from getting a sting feeling when an object like a ball hits a surface hard. Also, another design used to help runners balance, and run faster are shoes with springs in the soles. Unlike the traditional shoe mid soles made primarily of foams, rubber compounds, or

polymers, WaveSpring™ technology stores and disburses energy with every step. Testing performed by an independent source reports that 87% - 96% of the energy is returned from the WaveSpring™. This is the highest energy return score for any mid sole material ever tested.(3) Putting springs in the mid soles, gives a runner extra force, making one able to run faster and will not get tired as easily because of the energy that is getting reserved due to the springs. There are so many other types of equipment that has the knowledge of physics behind it.

Just like the sports equipment, some sports are a more fun way of implying physics. Sports like the long jump, basketball, baseball and pole vault are surrounded by physics. There is physics related to sports because it involves motion and how gravity, mass and distance has a lot to do with where an object lands; and in many sports that is very important. With the long jump, the longer the hang time the higher the score. With the right amount of speed and vertical acceleration, the better the hang time. Hang time depends on the vertical velocity at take-off. The greater the vertical velocity the higher the athlete can jump and the longer he remains in the air.  $Distance = velocity \times time$ . Distance can be increased by increasing velocity, time or both. (4) Many athletes have to have the knowledge of physics in mind to get the highest scores; this is why physics relates to sports. Another sport that has been around for many years is pole vaulting. Pole vaulting technology had increased with a great sense of physics. As the physics got better, the pole vaulting pole has improved. Competitive pole vaulting began with bamboo poles. As the heights attained increased, the bamboo poles gave way to tubular steel, which was tapered at each end. Today's pole vaulters benefit from poles produced

by wrapping sheets of fiberglass around a pole mandrel (pattern), to produce a slightly pre-bent pole that bends more easily under the compression caused by an athlete's take-off.(5) The modern day poles are built to withstand the weight of the athlete and the pressure given in the bend. When bamboo poles were used, they broke very easily, and would injure the athlete. But now poles are built so they do not break, which is safer.

In conclusion, physics is really strong when it comes to sports and fitness. The relationship between sports and sports equipment all relate to physics with a lot of proof. Such as machines that put less strain on muscles, or how sports technology has improved. Also the technique of sports games improved as well. Many people are out there working on better and safer technology for not only athletes but anyone. A lot of sports and fitness has improved over the years, as the physics improves so does the sports technology.

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APA format

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